

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Customer Number: 20277
Yukihiro OISHI, et al. : Confirmation Number: 9363
Application No.: 10/561,536 : Group Art Unit: 1793
Filed: December 19, 2005 : Examiner: Velasquez, Vanessa T
For: MAGNESIUM-BASE ALLOY SCREW AND METHOD OF MANUFACTURING THE SAME

REPLY BRIEF PURSUANT TO 37 C.F.R. § 41.41

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § 41.41, the following Remarks are respectfully submitted in response to the Examiner's Answer dated June 8, 2009. Appellants reassert all arguments contained in the Principal Brief.

Reply to Examiner's Answer

In the Examiner's Answer, the Examiner replies to arguments set forth in the Appeal Brief filed on April 16, 2009 in the "Response to Arguments". Applicants respond to the Response to Arguments as follows.

In the Response to Arguments section on page 8-9, with regard to the Applicants argument that the conventional techniques of the prior art would not produce the claimed crystal grain diameter because the working temperatures of *Housh* are not in the claimed range, the Examiner alleges that *Housh* does teach working with temperatures below 250 °C. For example, the Examiner cites Table 16 of *Housh* which discloses magnesium alloys AZ31B-H24, AZ80A-T5 and ZK60AT5 that may be formed at 163, 193 and 204 °C, respectively. However, each of these examples are either produced by a sheet or an extrusion, and not from a drawn material as is required in claim 1. In fact, *Housh* provides no examples of materials made via a drawing process at under 250 °C. As such, *Housh* fails to disclose screws produced at the claimed temperature range.

Moreover, *Housh* does not distinguish between magnesium compounds formed at temperatures over or under 250 °C. In contrast, the present disclosure shows, in Table 1, that a drawing method to form screws at lower than 250 °C produces screws with favorable tensile strength that perform better than screws drawn at higher than 250 °C. As is shown, the six screws drawn at over 250 °C all had problems with lifetime because the temperature was too high, whereas several of the screws drawn below 250 °C exhibit strong tensile strength and longevity. As such, Applicants point out that unexpected superior results arise from using a temperature of 250 °C or lower in the drawing process.

On page 9 with regard to the argument that none of the references disclose the claimed average crystal grain diameter, the Examiner alleges that varying processing parameters is well known in the art, and that it would be obvious to optimize the degree of deformation to achieve the desired grain size. Applicants respectfully disagree.

Since magnesium and its alloys have extremely poor plastic workability at low temperature (i.e., room temperature) due to their hexagonal close-packed lattice (hcp) structure, drawing of a magnesium-based alloy must be carried out at a high temperature of over 200 °C. When working at such high temperatures, grain growth advances and grain structure becomes coarse. Therefore, it is difficult to achieve a uniform and fine structure in a drawn material even if the degree of deformation is controlled. Accordingly, it is not obvious to one skilled in the art to control grain diameter by optimizing the degree of deformation, which is optimized at a higher temperature.

However, in the present disclosure, magnesium-based alloy wire is obtained by a specific drawing method in which the temperature is from 50 – 200 °C. As a result, a uniform and fine structure with an average crystal grain diameter of 10 µm or less and a maximum crystal grain diameter of 15 µm or less is achieved.

Furthermore, it is alleged by the Examiner that *Housh* teaches “drawing” in a single draw in paragraph 4, sentence 4 (“deep drawing”). However, Applicants would point out that “deep drawing” and “drawing” are two different types of plastic working. “Deep drawing” as disclosed in *Housh* is a process performed to form a material into a cup. For example, Fig. 15 of *Housh* shows the effect of deep drawing in forming a cup. As such, it is clear that this technique is not utilized to make screws and accordingly, is not applicable to the present disclosure.

In view of the above arguments and those set forth in the Appeal Brief, Applicants have demonstrated that the combination of Thum & Lorenz, Housh, Hawley's Condensed Chemical Dictionary, Higgins and Callister, Jr. is improper. Appellants respectfully submit that the Examiner's rejections under 35 U.S.C. § 103 are not legally viable. Appellant, therefore, respectfully solicits the Honorable Board to reverse the Examiner's rejections of claims 1-5, 22 and 23 under 35 U.S.C. § 103(a) for obviousness predicated upon Thum & Lorenz, Housh, Hawley's Condensed Chemical Dictionary, Higgins and Callister, Jr.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP



Nathaniel D. McQueen
Registration No. 53,308

**Please recognize our Customer No. 20277
as our correspondence address.**

600 13th Street, N.W.
Washington, DC 20005-3096
Phone: 202.756.8000 NDM:MWE
Facsimile: 202.756.8087
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